

--19. (twice amended) The welding process as claimed in claim 1, wherein said metal workpieces have different thicknesses.--

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--20. (twice amended) The welding process as claimed in claim 1, wherein said metal workpieces have the same or different thicknesses and have different metallurgical compositions or metallurgical grades.--

--21. (twice amended) The welding process as claimed in claim 1, wherein the edges comprise two longitudinal edges of a pre-tube.--

REMARKS

The application has been amended so as to place it in condition for allowance at the time of the next Official Action.

The abstract has been amended with regard to formal matters.

The specification has been amended to insert section headings and to provide a brief description of the drawings.

Claims 1-16 and 18-21 are present in the application.

Claims 1-9, 11-13, 16, and 18-21 have been amended.

Claim 17 has been canceled.

Claims 1-21 were rejected under 35 USC §112, second paragraph, as being indefinite.

Claims 1-9, 11-13, 16, and 18-21 have been amended to overcome the bases for rejection under 35 USC §112, second paragraph, set forth in the Official Action.

Claim 1 was rejected under 35 USC §102(b) as being anticipated by HAMASAKI 4,507,540. Claims 1-4, 7-9, 15, and 17 were rejected under 35 USC §103(a) as being unpatentable over HAMASAKI in view of CHURCH 4,572,942. Claims 1 and 13 were rejected under 35 USC §103(a) as being unpatentable over HAMASAKI in view of JP 55-24739. Claims 1 and 10 were rejected under 35 USC §103(a) as being unpatentable over HAMASAKI in view of MEEHAN, deceased et al. 3,939,323. Claims 1, 5, 6, and 11 were rejected under 35 USC §103(a) as being unpatentable over HASHIMOTO et al. 6,034,343 in view of EP 0 639 423. Claims 1 and 14 were rejected under 35 USC §103(a) as being unpatentable over HASHIMOTO et al. in view of GB 1 358 985. Claim 20 was rejected under 35 USC §103(a) as being unpatentable over HASHIMOTO et al. in view of GB 1

358 985 and further in view of COOK 2,790,656. Claims 16, 18, 19, and 21 were rejected under 35 USC §103(a) as being unpatentable over HASHIMOTO et al. in view of GB 1 358 985 and further in view of BEYER et al. 5,821,493 and STEEN 4,0167,662. Applicants respectfully traverse these rejections.

Claim 17 has been canceled and its subject matter incorporated into amended claim 1.

Amended claim 1 recites "wherein the at least one electric arc is generated by a non-consumable electrode".

Both HAMASAKI and HASHIMOTO et al. describe processes for welding metal workpieces while producing a welded joint between edges of the workpiece in which the welded joint is produced by using a laser beam and an electric arc.

In sharp contrast to the inventive process of claim 1, HAMASAKI and HASHIMOTO et al. generate the electric arc with a consumable electrode.

The additional applied patent publications describe various processes of welding and the use of various shielding gas compositions in welding processes.

Applicants respectfully submit that none of the additional applied patent publications describe or suggest to one of ordinary skill in the art to generate the electric

arc in the process described by HAMASAKI or HASHIMOTO et al. by a non-consumable electrode, as recited in claim 1. Dependent claims 2-16 and 18-21 are also considered to be allowable based on their dependency on claim 1.

It is noted that claim 12 was not rejected based on prior art references.

In light of the amendments discussed above, applicants believe that the present application is in condition for allowance and an early indication of the same is respectfully requested.

If the Examiner has any questions or requires clarification of any of the above points, the Examiner may contact the undersigned agent so that this application may continue to be expeditiously advanced.

Attached hereto is a marked-up version of the changes made to the abstract and claims by the current amendment. The attached page is captioned "**Version with markings to show changes made.**"

Respectfully submitted,

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ABSTRACT OF THE DISCLOSURE

--Process for welding one or more metal workpieces to be joined together by producing at least one welded joint between edges to be welded of the metal workpiece or workpieces, the welded joint being obtained by using at least one laser beam and at least one electric arc, in which process, during welding of the joint, at least one part of a welding zone comprising at least one part of the welded joint is shielded during welding with at least one shielding atmosphere formed by a gas mixture consisting of argon and/or helium with a content greater than or equal to 70% by volume; and at least one additional compound chosen from H₂, O₂, CO₂ and N₂ with a content of 0 to 30% by volume.--

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims were amended as follows:

--1. (amended) A process for welding one or more metal workpieces to be joined together by producing at least one welded joint between [the] edges to be welded of [the] said metal workpiece or workpieces, [the said welded joint being obtained] by using at least one laser beam and at least one electric arc, in which process, during welding of the joint, shielding at least one part of [the] a welding zone comprising at least one part of said welded joint [is shielded] during [the operation] welding with at least one shielding atmosphere formed by a gas mixture consisting of:

- argon and/or helium with a content greater than or equal to 70% by volume; and

- at least one additional compound chosen from H₂, O₂, CO₂ and N₂ with a content of 0 to 30% by volume, and

wherein the at least one electric arc is generated by a non-consumable electrode.--

--2. (amended) The welding process as claimed in claim 1, wherein the content of at least one additional compound chosen from H₂, O₂, CO₂ and N₂ is non zero and less

than or equal to 20% by volume[, preferably non zero and less than or equal to 15% by volume].-

--3. (twice amended) The welding process as claimed in claim 1, wherein the shielding atmosphere is formed by a gas mixture consisting of argon with a content greater than or equal to 70% by volume and of at least one additional compound chosen from H₂, O₂, CO₂ and [N₇] N₂ with a content of 0.1 to 30% by volume[, preferably a gas mixture consisting of argon with a content greater than or equal to 70% by volume and of 0.1 to 30% by volume of an additional compound chosen from H₂, O₂, CO₂ and N₂].-

--4. (twice amended) The welding process as claimed in claim 1, wherein the shielding atmosphere is formed by a gas mixture consisting of argon with a content greater than or equal to 70% by volume and of 0.1 to 30% by volume of several additional compounds chosen from H₂, O₂, CO₂ and N₂[, preferably a mixture of argon, O₂ and CO₂].-

--5. (twice amended) The welding process as claimed in claim 1, wherein the shielding atmosphere is formed by a gas mixture consisting of helium with a content greater than or equal to 70% by volume and of at least one

additional compound chosen from H₂, O₂, CO₂ and N₂ with a content of 0.1 to 30% by volume[, preferably a gas mixture consisting of helium with a content greater than or equal to 70% by volume and of 0.1 to 30% by volume of an additional compound chosen from H₂, O₂, CO₂ and N₂] .-

--6. (twice amended) The welding process as claimed in claim 1, wherein the shielding atmosphere is formed by a gas mixture consisting of helium with a content greater than or equal to 70% by volume and of 0.1 to 30% by volume of several additional compounds chosen from H₂, O₂, CO₂ and N₂[, preferably a mixture of helium, O₂ and CO₂ and furthermore possibly containing H₂] .--

--7. (twice amended) The welding process as claimed in claim 1, wherein the shielding atmosphere is formed by a gas mixture consisting of at least 70% by volume of helium and argon and of 0.1 to 30% by volume of at least one additional compound chosen from H₂, O₂, CO₂ and N₂[, preferably a gas mixture consisting of 0.1% to 69.9% by volume of helium, of 0.1% to 69.9% by volume of argon and of 0.1 to 30% by volume of at least one additional compound chosen from H₂, O₂, CO₂ and N₂, the sum of the argon and

helium contents being at least 70% of the total volume of the mixture].--

--8. (twice amended) The welding process as claimed in claim 1, wherein the workpiece or workpieces to be welded are made of a metal or a metal alloy chosen from coated or uncoated steels, [particularly assembly steels, HLES steels, carbon steels, steels having a layer of zinc alloy on the surface, stainless steels,] aluminum or aluminum alloys [and high yield point steels].--

--9. (twice amended) The welding process as claimed in claim 1, wherein the shielding atmosphere is formed by a gas mixture consisting of at least 70% by volume of helium and/or argon and of 0.1 to 30% by volume of at least one additional compound chosen from O₂ and CO₂ and wherein the workpiece or workpieces to be welded are made of steel[, especially carbon steel].--

--11. (twice amended) The welding process as claimed in claim 1, wherein the shielding atmosphere is formed by a gas mixture consisting of at least 90% by volume of helium or of argon and of 0.1 to 10% by volume of at

least one additional compound chosen from O₂ and CO₂, and wherein the workpiece or workpieces to be welded are made of aluminum[, preferably of at least 96% by volume of helium or argon and of 0.1 to 4% by volume of at least one additional compound chosen from O₂ and CO₂.--

--12. (twice amended) The welding process as claimed in claim 1, wherein the shielding atmosphere is formed by a gas mixture consisting of at least 85% by volume of helium or of argon and of 0.1 to 15% by volume of H₂, and wherein the workpiece or workpieces to be welded are made of stainless steel[, preferably of at least 90% by volume of helium or argon and of 0.1 to 10% by volume of H₂].--

--13. (twice amended) The welding process as claimed in claim 1, wherein the shielding atmosphere is formed by a gas mixture consisting of at least 70% by volume of helium and/or argon and of 0.1 to 30% by volume of N₂, and wherein the workpiece or workpieces to be welded are made of steel[, preferably of at least 80% by volume of helium and/or argon and the balance being N₂].--

--16. (twice amended) The welding process as claimed in claim 1, wherein the electric arc is delivered by a plasma-arc torch [and preferably the laser beam and said arc are delivered by a single welding head].--

--18. (twice amended) [Use of a] The welding process as claimed in claim 1, [for welding] wherein said metal workpiece comprises at least one tailored blank intended to constitute at least one part of a vehicle body element.-

--19. (twice amended) [Use of a] The welding process as claimed in claim 1, [for joining together, by welding,] wherein said metal workpieces [having] have different thicknesses[, particularly tailored blanks].-

--20. (twice amended) [Use of a] The welding process as claimed in claim 1, [for joining together, by welding,] wherein said metal workpieces [having] have the same or different thicknesses and [having] have different metallurgical compositions or metallurgical grades[, particularly tailored blanks].-

--21. (twice amended) [Use of a] The welding process as [claim] claimed in claim 1, [for joining together, by welding,] wherein the edges comprise two longitudinal edges of a pre-tube.-

IN THE ABSTRACT:

The Abstract of the Disclosure was amended as follows:

--Process for welding one or more metal workpieces to be joined together by producing at least one welded joint between [the] edges to be welded of the [said] metal workpiece or workpieces, the [said] welded joint being obtained by using at least one laser beam and at least one electric arc, in which process, during welding of the joint, at least one part of [the] a welding zone comprising at least one part of [said] the welded joint is shielded during [the operation] welding with at least one shielding atmosphere formed by a gas mixture consisting of argon and/or helium with a content greater than or equal to 70% by volume; and at least one additional compound chosen from H₂, O₂, CO₂ and N₂ with a content of 0 to 30% by volume.

[Figure 3]--